Cancer Incidence & Mortality along the Texas-Mexico Border

Office of Minority Health
Resource Center
PO Box 37337
Washington, DC 20013-7337

Texas Department of Health
August 1996

MH97D3088

avid R. Smith, M.D.
ommissioner of Health

TDH

Walter D. Wilkerson, Jr, M.D., Chairman
Board of Health

This publication was prepared by:

Texas Cancer Registry
Texas Department of Health
1100 West 49th Street
Austin, TX 78756
(512) 502-0680

Funding:

This publication is made possible in part by funding from the Texas Department of Health, Office of Border Health.

Acknowledgments:

This report is a product of the efforts of the entire Registry staff. The Registry wishes to thank the health facilities located along the Texas-Mexico border for their cooperation in reporting cancer incidence for their areas.

Suggested citation:

Texas Cancer Registry. Cancer Incidence and Mortality Along the Texas-Mexico Border. Austin, Texas: Texas Department of Health, August, 1996.

Copyright information:

All material in this report is in the public domain and may be reproduced or copied without permission; citation as to source, however, is appreciated.

M+197D3088

Texas Department of Health

David R. Smith, M.D.
Commissioner

Carol S. Daniels
Deputy Commissioner for Programs

Roy L. Hogan
Deputy Commissioner for Administration

Randy P. Washington
Deputy Commissioner
for Health Care Financing

1100 West 49th Street
Austin, Texas 78756-3199
(512) 458-7111

MEMBERS OF THE BOARD

Walter D. Wilkerson, Jr., M.D., Chairman
Mary E. Ceverha, M.P.A., Vice-Chair
Ramiro R. Casso, M.D.
David L. Collins, P.E.
Ruth F. Stewart, M.S., R.N.C.
Betsy Triplett-Hurt

FOREWORD

The Rio Grande River winds through an area of Texas unique in its culture, geography, economy, and problems. The Texas-Mexico border area is not only a geo-political boundary, but also a place where the peoples of two cultures, two languages, and two different levels of economic development meet and interact. The population of the border area has exploded in the past 20 years -- almost 1.9 million people are expected to live on the Texas side of the border region by the year 2000. Unfortunately, it is a population characterized by high rates of poverty and disease.

The health of these border residents is a continuing priority of the Texas Department of Health. In 1994, the Department created the Office of Border Health to assist with the improvement of health conditions in this population. The Border Health Office has encouraged collaborative efforts with other Divisions within the Department to address specific border health issues. This study by the Texas Cancer Registry is a product of one such collaboration undertaken to describe the cancer experience of this unique region of Texas.

This is the first report to present cancer incidence and mortality data specifically for the Texas-Mexico border area population. These data give a solid basis for development of targeted interventions by the Texas Department of Health and other state, national and international agencies working for and with the border residents to improve the quality of life and health for Texans living in this area. Continued collection and analysis of cancer data will allow the Texas Department of Health to evaluate the success of cancer control interventions, to identify and monitor those subgroups at highest risk, and to investigate suspected clusters of excess cancer in this area. This joint effort by the Texas Cancer Registry and the Border Health Office underscores the continuing commitment within the Texas Department of Health to identify and address the unique public health issues and concerns facing Texas residents living along the Texas-Mexico border.

Sincerely,

David R. Smith, M.D.
Commissioner of Health

Walter D. Wilkerson, Jr., M.D., Chairman
Board of Health

Executive Summary

The unique character of the Texas-Mexico border area has led to much interest, speculation and concern about the health status of the residents of this area in general, and their cancer experience in particular. So it is encouraging to note in this report by the Texas Cancer Registry (TCR), Texas Department of Health, that while the border area is unique in many demographic and geographic characteristics, its cancer experience is not greatly different than that experienced elsewhere. The border area had an average of approximately 2.8 cancer cases per 1,000 residents reported annually, a rate that is slightly lower than the national average. When comparing the border data to California data, a population with similar racial and ethnic composition, the TCR found that the type and magnitude of cancer cases and deaths reported for this area are, in general, similar to or lower than those of the comparison population.

As with most areas of the United States, prostate cancer was the most common form of cancer diagnosed in border males and breast cancer the most common in females. Lung cancer, a type of cancer with poor survival, was a leading cause of cancer-related death in both males and females. Among children living in the border area, the leading types of cancers diagnosed were leukemias and central nervous system tumors, the cancer sites typically predominant in children.

Perhaps the most interesting finding in this study is the differing pattern of cancer incidence and mortality among Anglos and Hispanics. This analysis found that for most cancer sites, Hispanics experience substantially lower rates of cancer incidence, a finding consistent with several studies in other populations. For example, although prostate cancer was the most common cancer diagnosed in both Anglo and Hispanic men, the incidence rate for Hispanics was 74% less than that of Anglos. The same pattern was seen among women in the border, with Anglo females having a breast cancer incidence rate 1.5 times higher than that of Hispanic females.

There were, however, notable exceptions to the lower levels of cancer in Hispanics as compared to Anglos. Hispanic women had a statistically significant two-fold greater rate of cervical cancer incidence and mortality than Anglo women. Because cervical cancer is one of the few cancers that is amenable to prevention through screening, this finding underscores the need for targeted Pap screening efforts. Another troubling exception was found in the prostate cancer data. Despite the much higher incidence rate of prostate cancer in Anglo males, the mortality rate for this cancer was approximately equal in men of both race/ethnic groups. This may indicate either a problem with access to medical care among Hispanic males, or that more cases in Hispanics are diagnosed at a late stage, resulting in poorer survival. Both of these examples indicate that while the overall cancer experience of the border area compares favorably to other U.S. populations, there is still the potential to reduce cancer incidence and mortality for this population. With data such as these provided by the TCR, the Texas Department of Health and its partners in public health can further the work towards clarifying and addressing cancer prevention and control issues along the Texas-Mexico border.

Table of Contents

Cancer Incidence and Mortality Along the Texas-Mexico Border

INTRODUCTION

Figure 1
TEXAS-MEXICO BORDER AREA

The border region is a unique area of Texas, with a culture, geography and economy distinct from the rest of the state. The area stretches 889 miles from El Paso to Brownsville and is characterized by a rapidly growing population that is on the average younger and poorer than the rest of Texas. The Texas Department of Health (TDH) has made identifying and addressing health and quality of life issues for residents of the border area a priority. As a part of this initiative, the Texas Cancer Registry (TCR) of the Texas Department of Health, with funding from the TDH Office of Border Health, conducted a study of the cancer incidence and mortality experience of Texans living along the Texas-Mexico border. The following report presents the results of this study.

METHODS

BORDER COUNTIES

Brewster
Cameron
Culberson
Dimmit
El Paso
Hidalgo
Hudspedth
Jeff Davis
Kinney
Maverick
Presidio
Starr
Terrell
Val Verde
Webb
Willacy
Zapata
Zavala

An 18-county area along the Texas-Mexico border was defined for the purposes of this study (Figure 1). In 1990, the population of this area was approximately 1.6 million, almost 80% of whom were Hispanic. African Americans accounted for less than two percent of the total study population (Figure 2). There were roughly equal numbers of males to females overall in each of the racial/ethnic groups.

Figure 2
TEXAS-MEXICO BORDER AREA POPULATION, 1990

BORDER AREA CANCER STATISTICS
1990-1993

Average number of cancer cases diagnosed each year*: **4,356**[1]

Average number of cancer deaths reported each year: **1,936**[2]

*1990-1992

[1] 2.8 cancer cases per 1,000 residents

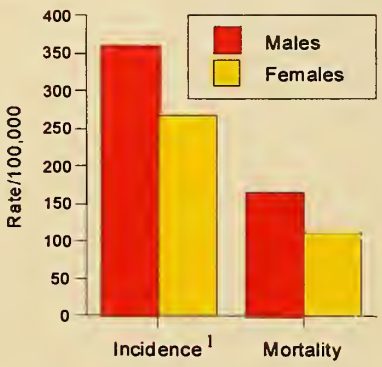
[2] 1.2 deaths per 1,000 residents

The data analyzed consist of cancer cases diagnosed during 1990-1992 ("incidence") and cancer-related deaths occurring during 1990-1993 ("mortality") among residents of the study area. All incident reports of cancer were reviewed to eliminate inclusion of multiple reports for a single case and to determine primary cancer sites. The number of cancer cases and deaths among African Americans in the border area was too small to generate stable statistics, consequently this report presents data only for Anglo (white, non-Hispanic) and Hispanic males and females.

Average annual number of cases or deaths and average annual rates are presented by race/ethnicity and sex for individual cancer sites. Rates were standardized by age with the direct method of adjustment, using the US 1970 standard million population, and are presented per 100,000 population (see Technical Notes). The TDH Bureau of State Health Data and Policy Analysis provided age-, sex-, race/ethnicity-, county- and year-specific population estimates for the calculation of rates. To evaluate the cancer experience of the border area as compared to an external standard, border incidence and mortality rates were compared with rates for Anglo and Hispanic residents of California. California was chosen as a comparison population due to: 1) the lack of statewide cancer incidence data for Texas; and 2) the lack of Hispanic rates for national cancer incidence data (see Technical Notes for detailed discussion of comparison methodology).

RESULTS

Figure 3
RATES OF TOTAL CANCERS
Males and Females, 1990-1993

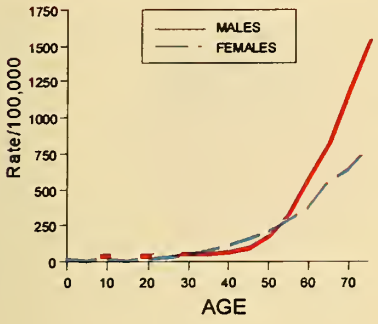


[1]For 1990-1992 only

During the study period, there was an average of 4,356 cancer cases and 1,936 cancer deaths reported annually for Anglo and Hispanic residents of the 18 counties of the Texas-Mexico border area (Appendix I, Tables 1 and 2). Hispanic incidence and mortality rates were lower than Anglo rates for most cancer sites, with the exception of stomach, liver, gallbladder, kidney (incidence only) and cervix.

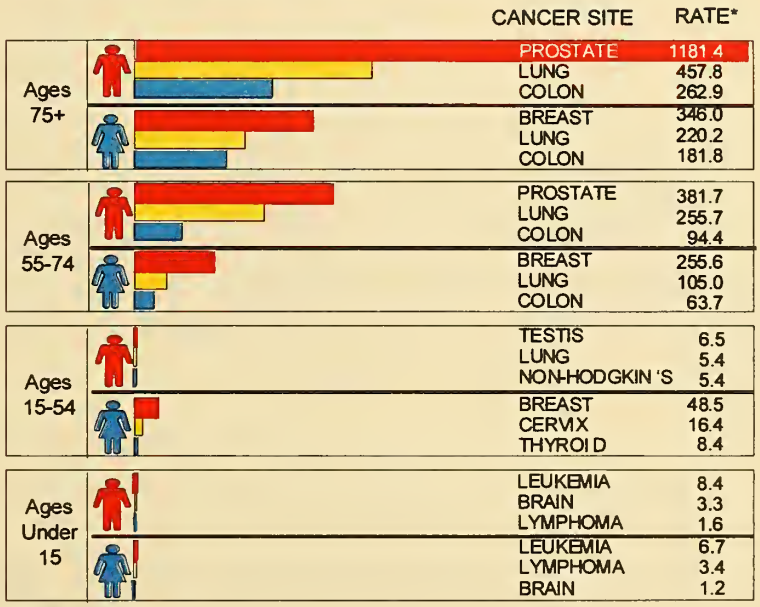
In general, males had higher age-adjusted cancer incidence and mortality rates than females (Figure 3). Gallbladder and thyroid cancers were the only cancer sites where females experienced both higher incidence and higher mortality rates than males (for those sites common to both sexes).

Figure 4
AGE-SPECIFIC CANCER RATE
Males and Females, 1990-1992



The age-specific incidence rates for Texans living in the border area show that overall, cancer is rare among children, increases in young adults and is highest among older adults (Figure 4). Eighty-six percent of all cases diagnosed in males occurred among men ages 55 and older, as compared with 71% in women. As seen in Figure 5, breast cancer in young women is the primary reason that females have higher rates than males between the ages of 15 and 54. After age 55, male rates rapidly surpass female rates. Prostate cancer, a disease primarily of older men, is largely responsible for the almost two-fold difference in rates among males and females after age 75.

Figure 5
LEADING INCIDENT CANCERS BY AGE GROUP
Males and Females, 1990-1992



*Rate per 100,000

Males

Prostate cancer was the leading cancer incidence site in males, accounting for 28% of all cancer cases, and was second only to lung cancer for cancer mortality (Figure 6). Lung cancer accounted for 16% of cancer incidence and 27% of cancer mortality in males. Prostate, lung, colon and bladder cancers alone accounted for over half (56%) of all cancer cases in males. Similarly, the four leading cancer sites (lung, prostate, colon, pancreas) comprised 50% of all cancer-related deaths in males.

LEADING SITES FOR CANCER CASES
Males, 1990-1992

ANGLO

Cancer	*# cases**	*rate*	*%***
Prostate	351	133.7	31.8
Lung	198	82.5	18.0
Colon	93	37.8	8.4
Bladder	64	26.2	5.8
Buccal	36	17.3	3.2

HISPANIC

Cancer	*# cases**	*rate*	*%***
Prostate	276	76.7	24.1
Lung	162	43.8	14.2
Colon	71	18.7	6.2
Stomach	51	13.3	4.4
Kidney	51	12.9	4.4

LEADING SITES FOR CANCER DEATHS
Males, 1990-1993

ANGLO

Cancer	*# deaths**	*rate*	*%***
Lung	148	60.4	32.9
Prostate	53	19.6	11.8
Colon	39	15.9	8.7
Pancreas	24	9.4	5.2
Leukemia	21	9.2	4.7

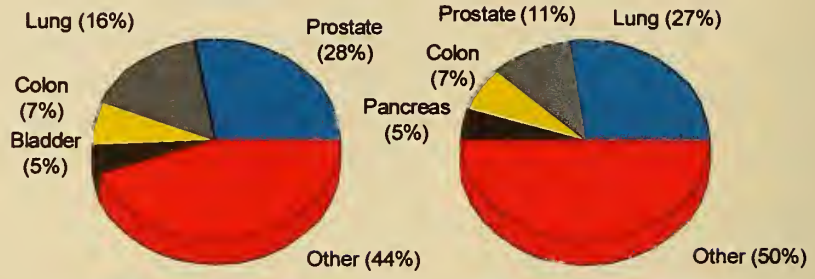
HISPANIC

Cancer	*# deaths**	*rate*	*%***
Lung	134	36.1	23.0
Prostate	65	18.3	11.2
Stomach	41	10.6	7.0
Colon	37	9.6	6.3
Liver	36	9.4	6.1

*Average annual number of cases/deaths.

**Percent of total cases/deaths.

Figure 6
LEADING CANCER SITES – INCIDENCE AND MORTALITY
All Males



Incidence, 1990-1992 **Mortality, 1990-1993**

Cancer incidence and mortality varied by race/ethnicity among males, both in terms of ranking of cancer sites and comparative magnitude of rates[1]. Prostate cancer was the most common cancer diagnosed in both Anglo and Hispanic men. However, the incidence rate for Hispanics (76.7 per 100,000) was 74% less than that of Anglos (133.7). Incidence rates for other leading cancer sites were also less among Hispanic males than Anglo males, with the exception of stomach, liver and kidney cancers (Appendix I, Table 1).

Lung cancer was the leading site for mortality in both race/ethnic groups, with Hispanics experiencing a statistically significantly lower mortality rate (36.1) than Anglos (60.4). Prostate cancer was the second leading cause of cancer mortality in border males. Although Hispanic males had a statistically significantly lower incidence rate for prostate cancer than Anglo males, mortality rates for the two race/ethnic groups were approximately equivalent (Anglo, 19.6; Hispanic, 18.3). With the notable exception of stomach and liver cancers, the general pattern of lower rates among Hispanics seen in the leading cancer incidence sites was repeated in the mortality statistics (Appendix I, Table 2).

[1] All rates are average annual age-adjusted rates and are reported per 100,000 population.

LEADING SITES FOR CANCER CASES
Females, 1990-1992

ANGLO

Cancer	*# cases**	*rate*	*%***
Breast	266	114.0	31.3
Lung	117	42.7	13.7
Colon	81	28.0	9.5
Corpus uteri	42	17.2	5.0
Ovary	39	16.8	4.6

HISPANIC

Cancer	*# cases**	*rate*	*%***
Breast	352	65.2	28.0
Cervix	108	18.8	8.6
Lung	92	18.1	7.3
Colon	69	13.4	5.5
Ovary	56	10.3	4.5

LEADING SITES FOR CANCER DEATHS
Females, 1990-1993

ANGLO

Cancer	*# deaths**	*rate*	*%***
Lung	87	30.3	23.7
Breast	64	25.6	17.3
Colon	35	12.4	9.6
Ovary	22	8.8	6.0
Leukemia	15	6.2	4.2

HISPANIC

Cancer	*# deaths**	*rate*	*%***
Breast	95	17.3	17.7
Lung	64	12.3	11.9
Pancreas	35	6.8	6.4
Stomach	31	5.8	5.7
Ovary	30	5.8	5.6

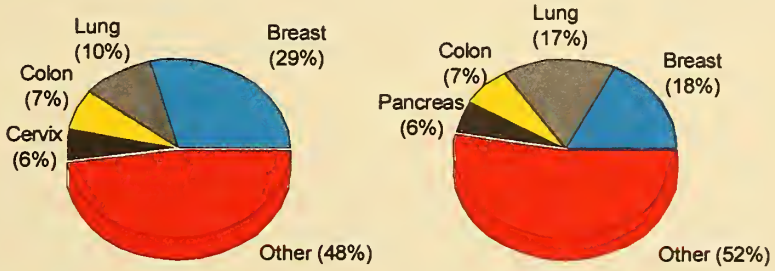
*Average annual number of cases/deaths.

**Percent of total cases/deaths.

Females

Breast cancer was the leading cancer site for both incidence and mortality among females in this study, accounting for 29% of all cancer cases and 18% of all cancer deaths (Figure 7). Although lung cancers comprised only a tenth of the total reported cases, there were almost as many deaths due to this cancer as there were for breast cancer (17% vs. 18%). Seven percent of both cancer cases and cancer deaths among border women was attributable to colon cancer. The four leading cancer sites for incidence (breast, lung, colon, cervix) and for mortality (breast, lung, colon, pancreas) accounted for approximately half of all reported cancer cases and deaths.

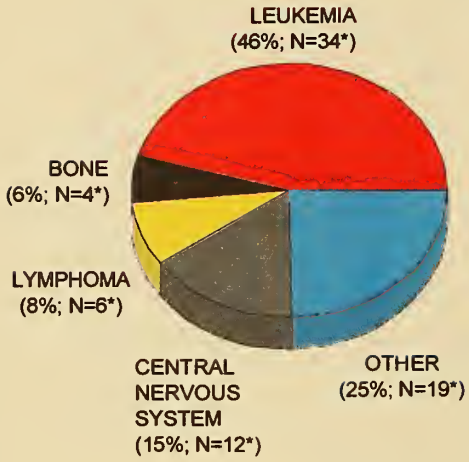
Figure 7
LEADING CANCER SITES - INCIDENCE AND MORTALITY
All Females



Incidence, 1990-1992 **Mortality, 1990-1993**

Cancer incidence and mortality differed among Hispanic and Anglo women in this study. As with the males, Hispanic women generally had lower incidence and mortality rates than their Anglo counterparts (Appendix I, Tables 1 and 2). Among the leading cancer sites, Anglo women had at least twice the incidence and mortality rates for lung and colon cancers than Hispanic women, and 1.5 times or higher rates for breast and ovarian cancers. This pattern is reversed with cervical cancer, however, with Hispanic females experiencing a statistically significant two-fold greater rate than Anglo females for both incidence (18.8 vs. 9.4) and mortality (5.7 vs. 2.9). Hispanic females also had approximately double the incidence (7.6 vs. 3.5) and mortality (5.8 vs. 2.5) rates of Anglo women for stomach cancer -- mirroring the pattern seen for males in the border area. Additionally, Hispanic females experienced two- to four-fold greater incidence and mortality for liver and gallbladder cancer as compared to Anglo females.

Figure 8
LEADING CHILDHOOD CANCERS
Males and Females,1990-1992



* Average annual number of cases

COMPARISON OF BORDER AREA WITH CALIFORNIA[1]
TOTAL CANCERS
Males and Females

INCIDENCE (1990-1992)

	Rate Ratio	(95% CI)
Anglo		
Male	0.98	0.95, 1.01
Female	0.95*	0.91, 0.98
Hispanic		
Male	0.93*	0.90, 0.97
Female	0.94*	0.91, 0.97

MORTALITY (1990-1993)

Anglo		
Male	0.91*	0.87, 0.96
Female	0.91*	0.87, 0.96
Hispanic		
Male	1.08*	1.03, 1.13
Female	0.95*	0.91, 0.99

*Statistically significant

[1]California average annual incidence and mortality rates, 1988-1992.

Childhood cancer

There were approximately 75 cancer cases and 21 cancer deaths reported annually in children under the age of fifteen residing in the study area. Slightly more cases and deaths were reported among male than female children. As would be expected based on the race/ethnic distribution of the population, Hispanic children accounted for the majority of the cancer cases and deaths.

Leukemia was the predominant cancer type diagnosed among the border children[2], accounting for 46% of the incident cases (Figure 8). The majority of leukemias reported among children were acute lymphocytic leukemias (ALL). The central nervous system was the second leading site for cancer cases (15%), with astrocytic brain tumors being the most commonly diagnosed tumor type. Lymphomas accounted for 8% of the total childhood cancers. Almost half of the lymphomas reported in children during the study period were non-Hodgkin's lymphoma. This distribution of cancer sites is consistent with national and state data (Ries, et al., 1994; Weiss et al., 1996).

Comparison with California Rates

Age-adjusted incidence and mortality rates for the border area were compared with cancer rates for the state of California (Perkins et al, 1995). California was chosen as the comparison population because of the availability of Hispanic-specific rates for this state (see Technical Notes).

ADULT CANCERS

With the exception of mortality in Hispanic males, incidence and mortality rates for all cancers combined were lower in the Texas-Mexico border area as compared to California. Differences in rates were more pronounced when the data were compared for the individual cancer sites (Appendix I, Table 3). Generally, for sites with a statistically significant difference in rates, Texans in the border area experienced lower incidence and mortality than the California population.

[2]Site-specific data for childhood cancer mortality is not presented in this report (see "Primary Site Codes" section in the Technical Notes).

Leading cancer sites [1]

ANGLO MALES

Mortality \ Incidence	↑	=	↓
↑	liver larynx	kidney	
=	esophagus		
↓	bladder	rectum [3] prostate [3]	stomach [3] melanoma brain non-Hodgkin's mult. myeloma

HISPANIC MALES

Mortality \ Incidence	↑	=	↓
↑	buccal [3] liver [3] gallbladder soft tissue Hodgkin's	bladder mult. myeloma	
=	esophagus bone		prostate [2] brain
↓			colon [2] rectum [2,3] melanoma

ANGLO FEMALES

Mortality \ Incidence	↑	=	↓
↑	liver [3] soft tissue [3] cervix	leukemia [3]	kidney Hodgkin's [3]
=	brain non-Hodgkin's		
↓	esophagus gallbladder	buccal bladder	rectum [2,3] pancreas [2,3] lung [2,3] melanoma [2]

HISPANIC FEMALES

Mortality \ Incidence	↑	=	↓
↑	liver [3] bone soft tissue cervix [3] kidney [2]	thyroid	
=	buccal melanoma [2]		ovary mult. myeloma
↓			colon [2,3] rectum [2,3] lung [2,3] corpus uteri [2,3] other female [3] bladder brain [3]

[1] Categories presented indicate excesses or deficits in Texas border area rates of 10% or more when compared to California rates. Comparisons are presented only for sites with stable rates (i.e. >= 10 cases/deaths) for both border area incidence and mortality data.

[2] Statistically significant difference in incidence rates.

[3] Statistically significant difference in mortality rates.

Incidence

Hispanic males had statistically significantly lower incidence of colon (20%), rectum (28%) and prostate cancers (15%), but almost two-fold higher incidence for cancer of the peritoneum (based on 12 cases in the border data). The only site showing a significant difference in rates among Anglo males was breast cancer, with border area males experiencing approximately twice the rate of California males (also based on 12 cases in the three-year study period).

Anglo females had no significantly increased site-specific incidence rates. However, they did have significantly lower incidence of rectum (26%), pancreas (31%), lung (15%), melanoma (27%), and corpus uteri (24%) cancers. Border area Hispanic females had 23% greater incidence of kidney cancer. In contrast, this group had lower incidence of colon (21%), rectum (28%), lung (15%), melanoma (47%), and corpus uteri (27%).

Mortality

All race/ethnic groups experienced statistically significantly lower mortality due to cancer of the rectum. In addition, Anglo males had lower rates of stomach (35%) and prostate (19%) cancers. Mortality rates were significantly increased for buccal (49%) and liver (55%) cancers in Hispanic males, and bone cancer in Anglo males was more than three times that of California males (based on a total of 11 cases).

Mortality rates for Hispanic females were significantly lower for colon, lung, brain, corpus uteri and "other" female genital cancers and significantly higher for liver (32%) and cervical (33%) cancers. Anglo females had statistically significantly lower mortality due to lung (20%) and pancreas (23%) cancers, and significantly higher mortality due to leukemia (33%). Additionally, Anglo women had approximately two-fold and higher rates of mortality due to Hodgkin's lymphoma, liver, and soft tissue cancers.

COMPARISON OF BORDER AREA WITH CALIFORNIA[1] CHILDHOOD CANCERS
Males and Females, Ages 0-14, 1990-1992.

	Rate Ratio	95% C.I.
Total cancers		
Anglo	1.09	0.66, 1.82
Hispanic	1.05	0.86, 1.29
Anglo	1.75*	1.12, 2.72
Hispanic	1.08	0.87, 1.35
Leukemia		
Anglo	----[2]	
Hispanic	1.38*	1.04, 1.84
Anglo	1.44	0.59, 3.47
Hispanic	1.34	0.96, 1.87
Central Nervous System		
Anglo	1.77	0.73, 4.30
Hispanic	0.88	0.51, 1.52
Anglo	---[2]	
Hispanic	0.89	0.50, 1.61

*Statistically significant.

[1]California average annual incidence rates, 1988-1992.

[2]Insufficient number of cases to allow for stable rate comparisons (n<5).

CHILDHOOD CANCERS

Cancer incidence rates for the leading childhood cancer sites (leukemias and central nervous system) as well as total cancer incidence in ages 0-14 were compared with California rates for Anglo and Hispanic children. Numbers of cancers for the remaining sites were too small to allow for comparison .

Incidence rates for all cancers combined among Hispanic children and Anglo males were similar to California rates. However, Anglo females had statistically higher total cancer incidence, although no one specific cancer site was significantly elevated. Hispanic males in the border area had a significantly higher (38%) incidence of leukemia. Rates among females of both races were elevated, however, the differences were not statistically significant. There were too few cases to compare leukemia rates among Anglo males (n<5).

Anglo males had a non-significant elevated incidence of central nervous system tumors, while Hispanic children experienced equivalent or lower rates when compared with California. As with leukemia in Anglo males, there were too few cases to allow a comparison of rates for central nervous system tumors in Anglo females.

DISCUSSION

The types of cancers and the magnitude of cancer rates varied substantially among the different groups that comprise the population of the Texas-Mexico border area. Hispanics, both males and females, generally experienced much lower rates of cancer incidence and mortality than Anglo residents of the study area. This is largely due to low incidence rates in Hispanics of the leading types of cancers (e.g. lung, breast, colon, and prostate). However, incidence and mortality rates for stomach, liver and gallbladder cancers were statistically significantly higher in Hispanics than Anglos, a pattern that was also seen in a study of cancer among Hispanic populations in the U.S. (Trapedo, et al., 1995).

Figure 9
PROSTATE CANCER INCIDENCE (1990-1992) AND MORTALITY (1990-1993)
Anglo and Hispanic Males

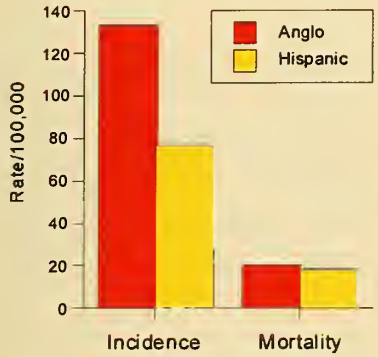
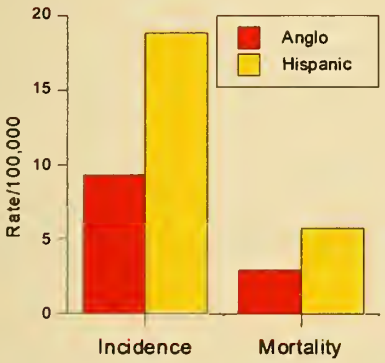


Figure 10
CERVICAL CANCER INCIDENCE (1990-1992) AND MORTALITY (1990-1993)
Anglo and Hispanic Females



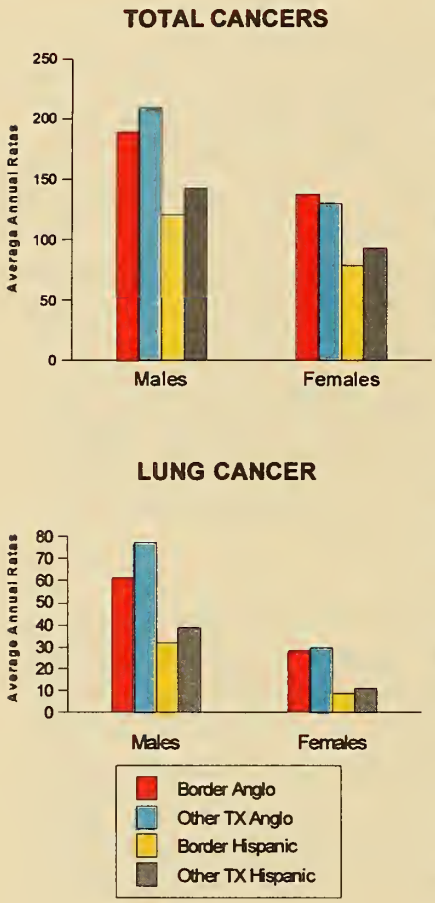
The reasons for elevated rates of these particular cancers in Hispanics are not clear. However, it is probable that variable genetic susceptibility, differential exposure to environmental agents and cultural practices are all contributory factors.

The differences in the Anglo and Hispanic cancer experiences were accentuated when the data were examined by gender. Stomach cancer clearly plays a larger role in the burden of cancer among Hispanic males. This cancer site was the fourth leading type of cancer diagnosed among Hispanic males, but ranked 13th for cancer incidence among Anglo males. Although the leading incident cancers for both Hispanic and Anglo males were prostate, lung and colon, Anglo rates were almost double the Hispanic rates. Despite the much higher incidence rate of prostate cancer in Anglo males, the mortality rate for this cancer was approximately equal for males in both race/ethnic groups (Figure 9). This may indicate that either: 1) there is differential access to or utilization of medical resources among Hispanic males diagnosed with prostate cancer; or 2) more cases are diagnosed at a late stage, resulting in poorer survival among Hispanic males.

Differences in cancer incidence and mortality were also seen among Hispanic and Anglo females in the study area. Lung cancer surpassed breast cancer as the leading cause of cancer mortality in Anglo, but not Hispanic women, possibly reflecting differences in past smoking behavior. In contrast, cervical cancer incidence and mortality rates among Hispanic women were twice that of Anglo women (Figure 10). Screening based on the Pap test effectively reduces risk of developing or dying from this cancer. The greater incidence and mortality for cervical cancer in Hispanic women living in the border area indicates a need for increased screening efforts targeted to this high-risk population.

Comparison of Texas-Mexico border area cancer statistics with those of California, a state with a similar racial/ethnic composition, indicated that the border area had equivalent or lower incidence and mortality rates for most cancer sites in adults. With the exception of liver cancer, this was also true for comparisons of border area Hispanics to California Hispanics and border area Anglos to California Anglos. Liver cancer incidence and mortality rates were elevated among all border area residents, but only mortality rates were statistically significantly different from California rates. A pattern of increasing liver

Figure 11
COMPARISON OF BORDER CANCER MORTALITY WITH TEXAS (1981-1991)[1]
Males and Females



Rates are per 100,000 population and are adjusted to 1970 U.S. standard million population.

[1] Reproduced from data presented at the 1993 Environmental Border Health Conference, San Antonio, Texas, and the 1995 U.S.-Mexico Border Conference on Women's Health, South Padre, Texas.

cancer mortality rates has been noted among Texas Anglo and Hispanics statewide over the period 1984-1993 (TCR data not presented). Reasons for these elevated rates are not clear. Known risk factors for primary liver cancer include chronic hepatitis B infection, alcoholic cirrhosis, and aflatoxin and occupational vinyl chloride exposures (Higginson, et al., 1992).

Although it was not possible to compare cancer incidence along the border with the rest of Texas, a previous study by the TCR found that cancer mortality rates among border residents were similar to or lower than rates for the state as a whole (data presented at the 1993 Environmental Border Health Conference, San Antonio, Texas, and the 1995 U.S.-Mexico Border Conference on Women's Health, South Padre, Texas)(Figure 11).

Cancers occurring among children ages 0-14 showed the same distribution of leading sites as national data, with leukemias and central nervous system tumors accounting for over half of all cancers diagnosed in this age group. In comparison with the California data for this age group, only total cancers in Anglo females and leukemias in Hispanic males were statistically higher among the border population than their California counterparts. The childhood data in this report were used to conduct an informal follow-up to a previous cancer cluster investigation of childhood cancers along the border and these data indicate that the elevation of leukemias in Hispanic males is largely driven by a significantly higher than expected number of acute lymphocytic leukemia (ALL) cases (data not presented). ALL was not significantly elevated in Hispanic females or Anglos of either sex. In contrast, acute non-lymphocytic leukemia (ANLL) occurred almost three-fold significantly higher than expected among Hispanic females, but not among other border children.

This inconsistent pattern of elevated rates in childhood cancers is not generally compatible with an environmental exposure, i.e., there is no apparent reason to believe that exposure to some carcinogen ubiquitous in the environment would differentially affect male but not female children, or vice versa. However, because childhood leukemia has been associated with various environmental exposures (e.g. radiation, alkylating agents, chloramphenicol, and pesticides), the TCR will continue to monitor incidence of childhood cancers in the border area. In addition, the Registry is pursuing collaboration with academic researchers interested in studying cancer incidence among children living in the Texas-Mexico border area.

ESTIMATED PROPORTION OF CANCER DEATHS ATTRIBUTABLE TO CIGARETTE SMOKING

Cancer site	Percent
lung	85
larynx & oral cavity	50-70
esophagus	50
bladder & kidney	30-40
pancreas	30
ALL CANCER DEATHS	**30**

(Source: United States Public Health Service (1982))

From a public health perspective, it is important to note that the leading cause of cancer death among residents of the Texas-Mexico border area was lung cancer. The major risk factor for this cancer, consumption of tobacco products, is completely avoidable through modification of personal behavior. It is estimated that approximately 85% of diagnosed lung cancers are directly related to smoking (Ernster and Cummings, 1991). Additionally, smoking has been linked to cancers of the larynx, oral cavity, esophagus, bladder, kidney and pancreas. The elimination of this risk factor alone would potentially result in 580 fewer cancer deaths per year in the border area.

Cancer mortality also can be reduced through the use of routine screening for cancers of the breast, cervix, and possibly prostate. Early detection of these cancers radically increases the probability of surviving. The 5-year relative survival rate among women diagnosed with breast cancer detected while still localized has risen from 78% in the 1940's to the current rate of 94% (ACS, 1995). The 5-year relative survival rates for early-stage prostate and cervical cancers are 94% and 90%, respectively.

Data-based interventions hold the most promise for reducing the rates of cancer incidence and mortality among Texas residents of the border area (Suarez, et al, 1991). Using the Texas Cancer Registry data presented in this report, interventions such as smoking cessation and screening programs can be tailored specifically to high-risk groups within the border population. Evaluation of the impact of cancer control efforts on both cancer incidence and mortality in the border area is also possible through use of Registry data.

Although intervention strategies are available for some cancers, cancer control efforts are limited by the lack of knowledge of the causes of most cancers. This report presents evidence of clearly differing patterns of cancer among Anglos and Hispanics living in the Texas-Mexico border area, a finding that can serve as a basis for developing hypotheses for etiologic research.

TECHNICAL NOTES

Technical Notes

Sources of Data

The TCR is a population-based cancer incidence reporting system that collects all incident reports of neoplasms occurring among Texas residents. Reports of cancer are submitted primarily by Texas hospitals and cancer treatment centers, along with outpatient clinics and free-standing pathology labs. TDH does not currently have a cancer data sharing agreement with Mexico. Consequently, cancers among Texas residents that are diagnosed and treated in Mexico are not available for analysis by the TCR.

The incidence data analyzed for this report was primarily abstracted from medical records and pathology reports. All reports of cancer received from the 18-county area were reviewed to eliminate inclusion of multiple reports for a single case and to determine primary cancer sites. Only primary malignant neoplasms were included in these analyses.

Cancer mortality data were extracted from computerized mortality files provided by the Bureau of Vital Statistics, Texas Department of Health. These mortality files contain demographic and cause of death information for all deaths occurring among Texas residents. For the purposes of this report, only deaths listing cancer as the underlying cause were included.

Indicators of Cancer Incidence Data Quality

The percentage of cases microscopically confirmed measures the quality of the diagnostic information used to assign the primary site. A case is microscopically confirmed if the diagnosis is based on autopsy, histology, cytology, or hematology findings. For the border area data, 91 percent of the total cancers were microscopically confirmed (Appendix II). This percentage compares favorably with the 92 percent confirmation reported by SEER (US Dept Health and Human Services, 1988).

To identify any cancer cases not reported to the TCR, information on all death certificates with the underlying cause of death due to malignant neoplasm was obtained from the Bureau of Vital Statistics, Texas Department of Health. Institutions listed on the death certificates as place of death were queried for additional cancer case information. Missed cases not identified from any institution were added to the TCR database. Cases for which the only available information is the death certificate, classified as "death certificate only" cases, were included in this report. Unless information was provided on the certificate, the date of death was considered to be the date of diagnosis for these cases. The percentage of death certificate only cases is presented by primary site in Appendix II. Of the 13,068 malignant cases, 4.8% were reported by death certificate only. This is slightly higher than the 3% standard suggested by the North American Association of Central Cancer Registries.

Primary Site Codes

Uniform cancer site coding schemes were used in this report to allow for comparison of Texas cancer incidence and mortality data with other state and national cancer data. Primary site and histologic type were coded for each cancer incident case using the International Classification of Diseases for Oncology (ICD-O) (WHO, 1976). The ICD-O codes corresponding to each primary site category in this report are presented in Appendix III.

For cancer mortality, the cancer sites presented correspond to site groupings (140-208) used by the National Cancer Institute (NCI) for the 9th Revision of the International Classification of Diseases (ICD-9) National Center for Health Statistics mortality data (WHO, 1977). The ICD-9 codes corresponding to the site groupings of the cancer deaths are shown in Appendix IV.

Childhood cancer site codes were assigned according to a classification scheme based primarily on cancer cell type (Birch and Marsden, 1987). This differs from the coding scheme for adult cancers, which is based primarily on cancer site. Data on cell type is not available directly from death certificate information and consequently, site-specific information on cancer deaths in children living in the study area is not presented in this report.

Race and Ethnicity of Cancer Cases and Deaths

Race and ethnicity was determined for each cancer patient based on information available from their medical records and classified according to SEER categories (SEER, 1983). Two categories are used to describe Caucasians: 1) Caucasians of Spanish surname or origin, and 2) Caucasian, not otherwise specified. These categories are referred to in this report as "Hispanic" and "Anglo," respectively.

As a quality control check of the Hispanic category, the Generally Useful Ethnic Search System (GUESS) program developed by Robert Buechley was used to classify cases into Spanish and non-Spanish surname categories (Buechley, 1976). Discrepancies were resolved by reviewing information on the original hospital abstracts. For this report, all cases of other or unknown race (61 cases or 0.4%) were included in the Anglo category.

The definition of the race and ethnicity categories for the cancer deaths is slightly different than that of the cases. Cancer deaths were categorized into three race/ethnic groups: Anglos, Hispanics and Blacks (African Americans). These three technically represent Blacks, non-Black Hispanics, and all others (non-Black, non-Hispanic). African American statistics are not presented in this report due to the small number of cancer cases and deaths among this race/ethnic group in the study area. The Hispanic category was based on Spanish surname as indicated by the GUESS program. Those deaths coded as "other" in the mortality data (20 or 0.2%) were included in the Anglo category.

Population Data

Estimates of the population for use in the calculation of age-specific and race/ethnicity-specific rates of cancer in the Texas-Mexico border counties were obtained from the Texas Department of Health, Bureau of State Health Data and Policy Analysis (Appendix V).

Data Analyses

Average annual incidence and mortality rates were age-adjusted using the direct method. Age adjustment eliminates the effects of different age structures in populations, allowing for direct comparison of incidence and mortality rates. Direct standardization weights the age-specific rates for a given sex, race/ethnicity or geographic area by the age distribution of the standard population. The 1970 United States standard million population was used as the standard for all rate calculations.

The formula to calculate age-adjusted incidence and mortality rates is:

$$\text{Age-adjusted Rate} = \frac{\sum_{a=1}^{n} i_a P_a}{\sum_{a=1}^{n} P_a} \times 100{,}000$$

where i_a = the age-specific incidence/mortality rate for age group a
P_a = the standard US population in each age group a
n = the number of age groups (16 five-year age groups)

Rates were calculated using five-year age intervals for ages <1 to 74 years, with persons 75 years and over grouped into one interval.

One measure of the reliability of a rate is the standard error (SE) which can be approximated as the age-adjusted rate divided by the square root of the number of cases or deaths from which the rate was calculated (Keyfitz, 1966). To further determine the magnitude of variability of an age-adjusted rate, a 95% confidence interval (CI) can be calculated using this approximated standard error. The formula for calculating a 95% confidence interval for a population rate is as follows:

$$95\%\ CI = r \pm (RC \times SE)$$

where r = the age-adjusted rate
RC = the reliability coefficient (1.96 at the 95% level)
$SE = r/\sqrt{d}$
d = the number of observed cases or deaths

Comparisons were made of the Texas-Mexico border area age-adjusted incidence and mortality rates with California rates. California was chosen as a comparison population due to the availability of Hispanic incidence and mortality rates; Hispanic rates are not presented in the National Cancer Institute's SEER program data reports. There were several factors which precluded a comparison of the border area rates with rates for the rest of Texas. The lack of statewide data has required the TCR to estimate

cancer incidence rates for the state of Texas based on those Public Health Regions (PHRs) with complete cancer incidence reporting (PHRs 1, 5, 8, 10, and 11). Unfortunately, the Hispanic population in the border area comprised over 80% of the total Hispanic population used to calculate the estimated statewide rate. Because of this weighting of the Hispanic data by the border population, 1) comparing the border area incidence rates to the estimated statewide rate would show no discernable difference in rates, and 2) removing the border counties from the statewide estimated rates would result in unstable Hispanic comparison rates due to small numbers. Although a comparison of incidence rates was therefore not feasible, a previous comparison of border area mortality rates with Texas mortality rates showed lower or similar rates for most cancer sites (data presented at the 1993 Environmental Border Health Conference, San Antonio, Texas and the 1995 U.S.-Mexico Border Conference on Women's Health, South Padre, Texas).

The California comparisons were done using the rate ratio method. Confidence intervals for these rate ratios were calculated based on a logarithmic transformation method described by Rothman (Rothman, 1986). Confidence intervals which do not include 1.0 indicate a statistically significant difference in rates. Due to the instability of rates based on small numbers, only those sites with 10 or more cases or deaths for the total time period in the Texas data were compared. The rates used to calculate rate ratios for comparing the Texas border area and California childhood cancer data were not age-adjusted, i.e. these rates were treated as age-specific rates for ages 0-14 years.

LITERATURE CITED

Literature Cited

American Cancer Society (ACS). Cancer Facts & Figures - 1995. American Cancer Society, Inc., Atlanta, GA, 1995.

Birch JM, Marsden HB. A classification scheme for childhood cancer. Int J Can 1987;40:620-624.

Buechley RW. Generally useful ethnic search system, GUESS. Presented to the annual meeting of the American Name Society, December, 1976.

Ernster VL, Cummings SR. Smoking and Cancer *in* American Cancer Society Textbook of Clinical Oncology, eds Holleb AI, Fink DJ, Murphy GP. American Cancer Society, Inc., Atlanta, GA, 1991.

Higginson J, Muir CS, Munoz N. Human Cancer: Epidemiology and Environmental Causes. Cambrige:Cambridge University Press, 1992.

Keyfitz N. Sampling variance of standardized mortality rates. Hum Biol 1966;38:309-317.

Perkins CI, Morris CR, Wright WE, and Young JL. Cancer Incidence and Mortality in California by Detailed Race/Ethnicity, 1988-1992. Sacramento, CA: California Department of Health Services, Cancer Surveillance Section, April 1995.

Ries LAG, Miller BA, Hankey BF, Kosary CL, Harras A, Edwards BK (eds). SEER Cancer Statistics Review, 1973-1991: Tables and Graphs, National Cancer Institute. NIH Pub. No. 94-2789. Bethesda, MD, 1994.

Rothman KJ. Modern Epidemiology. Boston/Toronto: Little, Brown and Company, 1986.

SEER Program. The SEER Program Code Manual. Bethesda: National Cancer Institute, 1983.

Suarez L, Martin J, Weiss N. Data-based interventions for cancer control in Texas. Tex Med 1991;87(8):70-77.

Trapido EJ, Valdez RB, Obeso JL, Strickman-Stein N, Rotger A, Perez-Stable EJ. Epidemiology of cancer among Hispanics in the United States. Monogr Natl Cancer Inst 18:17-28, 1995.

U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute. Annual Cancer Statistics Review including Cancer Trends: 1950-1985. NIH Publication No. 88-2789, 1988.

Weiss NS, Katz JA, Frankel LS, et al. Incidence of childhood and adolescent cancer in Texas. Tex Med 1996;92(7):54-60.

World Health Organization (WHO). International Classification of Diseases for Oncology, 1976. Geneva, Switzerland: WHO, 1976.

World Health Organization (WHO). Manual of the International Statistical Classification of Disease, Injuries and Causes of Death. Ninth revision, Vol. 1. Geneva, Switzerland: WHO, 1977.

APPENDICES

Table 1. Number of cancer cases[1] and average annual age-adjusted incidence rates[2] by sex and race/ethnicity. Texas-Mexico border area, 1990-1992.

CANCER SITE	MALES						FEMALES					
	ANGLO		HISPANIC		TOTAL		ANGLO		HISPANIC		TOTAL	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Buccal cavity	107	17.31	113	9.77	220	12.11	54	7.04	58	3.55	112	4.67
Esophagus	46	6.40	56	5.06	102	5.60	19	2.34	18	1.17	37	1.53
Stomach	59	8.46	152	13.34	211	11.44	32	3.53	120	7.61	152	6.28
Colon	278	37.79	212	18.74	490	26.54	244	28.03	208	13.36	452	18.69
Rectum	113	15.68	110	9.46	223	11.81	64	7.60	79	5.23	143	6.09
Liver	31	4.29	94	8.35	125	6.79	17	2.00	53	3.47	70	2.86
Gallbladder	11	1.44	43	3.97	54	2.96	17	2.05	81	5.42	98	4.14
Pancreas	67	9.44	91	8.22	158	8.55	50	5.37	115	7.56	165	6.76
Peritoneum	7	1.11	12	0.94	19	0.98	1	0.24	9	0.57	10	0.44
Nasal, sinus and ear	6	1.10	8	0.64	14	0.73	4	0.51	11	0.70	15	0.66
Larynx	65	9.06	75	6.66	140	7.60	12	1.41	12	0.76	24	0.97
Lung, bronchus	594	82.46	487	43.79	1081	58.07	350	42.70	276	18.06	626	26.18
Pleura	7	1.15	10	0.90	17	0.93	1	0.16	4	0.28	5	0.21
Bone	2	0.34	22	1.25	24	1.08	3	0.94	20	1.03	23	0.97
Soft tissue	16	2.65	35	2.55	51	2.56	13	2.70	39	2.22	52	2.16
Melanoma	86	14.91	23	1.89	109	5.81	54	8.29	28	1.64	82	3.38

[1]Total cases reported for the period 1990-1992.
[2]Rates are per 100,000, standardized to the US 1970 population.
[3]Total includes other sites not listed in table.

Table 1. Continued.

CANCER SITE	MALES						FEMALES					
	ANGLO		HISPANIC		TOTAL		ANGLO		HISPANIC		TOTAL	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Breast	12	1.73	1	0.10	13	0.69	799	114.00	1057	65.18	1856	79.95
Cervix uteri	0	0.00	0	0.00	0	0.00	54	9.35	325	18.82	379	15.92
Corpus uteri	0	0.00	0	0.00	0	0.00	127	17.15	156	9.90	283	12.43
Uterus, nos	0	0.00	0	0.00	0	0.00	7	0.70	28	1.75	35	1.44
Ovary	0	0.00	0	0.00	0	0.00	117	16.77	168	10.30	285	12.15
Other female genital	0	0.00	0	0.00	0	0.00	7	0.83	23	1.46	30	1.33
Prostate	1052	133.65	829	76.68	1881	99.78	0	0.00	0	0.00	0	0.00
Testis	29	5.77	61	2.92	90	3.53	0	0.00	0	0.00	0	0.00
Penis, other male organs	6	0.70	14	1.18	20	1.10	0	0.00	0	0.00	0	0.00
Bladder	191	26.24	131	11.77	322	17.30	51	5.79	42	2.74	93	3.80
Kidney, urinary	73	10.72	145	12.14	218	11.74	34	4.20	115	7.38	149	6.39
Brain and central nervous	37	7.04	64	4.25	101	4.90	37	6.62	56	3.00	93	3.83
Thyroid	18	2.91	23	1.79	41	2.20	46	8.53	115	6.12	161	6.41
Hodgkin's lymphoma	12	2.85	40	2.81	52	2.53	11	2.22	30	1.69	41	1.71
Non-Hodgkin's lymphoma	106	16.15	158	12.70	264	13.84	104	13.30	138	8.78	242	10.13
Multiple myeloma	28	3.87	56	4.90	84	4.52	27	3.21	47	3.01	74	3.10
Leukemia	88	13.85	145	9.56	233	11.29	55	7.94	126	7.02	181	7.50
TOTAL CANCERS[3]	3307	462.54	3437	295.38	6744	357.31	2555	343.81	3769	233.41	6324	266.70

[1]Total cases reported for the period 1990-1992.
[2]Rates are per 100,000, standardized to the US 1970 population.
[3]Total includes other sites not listed in table.

Table 2. Number of cancer deaths[1] and average annual age-adjusted mortality rates[2] by sex and race/ethnicity. Texas-Mexico border area, 1990-1993.

CANCER SITE	MALES						FEMALES					
	ANGLO		HISPANIC		TOTAL		ANGLO		HISPANIC		TOTAL	
	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
Buccal cavity	39	4.28	57	3.72	96	3.89	17	1.79	20	0.96	37	1.15
Esophagus	45	4.88	57	3.79	102	4.16	14	1.08	9	0.42	23	0.69
Stomach	39	3.81	163	10.62	202	8.08	32	2.45	122	5.79	154	4.71
Colon	157	15.94	147	9.56	304	12.15	141	12.39	111	5.25	252	7.71
Rectum	19	1.89	25	1.56	44	1.72	11	0.90	18	0.86	29	0.89
Liver	43	4.70	142	9.44	185	7.43	29	2.67	88	4.22	117	3.52
Gallbladder	4	0.35	31	2.14	35	1.40	12	0.92	70	3.38	82	2.53
Pancreas	94	9.40	131	8.71	225	9.00	74	5.53	139	6.75	213	6.40
Peritoneum	3	0.26	5	0.34	8	0.31	2	0.13	6	0.28	8	0.24
Nasal, sinus and ear	3	0.40	3	0.15	6	0.22	0	0.00	4	0.20	4	0.14
Larynx	23	2.35	26	1.68	49	1.94	6	0.55	6	0.26	12	0.35
Lung, bronchus	593	60.40	537	36.06	1130	44.99	349	30.29	254	12.26	603	18.40
Pleura	2	0.22	2	0.15	4	0.16	0	0.00	3	0.14	3	0.10
Bone	11	1.61	10	0.54	21	0.80	5	0.63	10	0.41	15	0.43
Soft tissue	7	0.80	21	1.24	28	1.08	18	2.23	28	1.29	46	1.47
Melanoma	29	3.51	12	0.72	41	1.60	15	1.69	14	0.65	29	0.92

[1]Total deaths reported for the period 1990-1993.
[2]Rates are per 100,000, standardized to the US 1970 population.
[3]Total includes other sites not listed in table.

Table 2. Continued.

CANCER SITE	MALES						FEMALES					
	ANGLO		HISPANIC		TOTAL		ANGLO		HISPANIC		TOTAL	
	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
Breast	4	0.43	4	0.27	8	0.33	255	25.56	379	17.31	634	20.00
Cervix uteri	0	0.00	0	0.00	0	0.00	29	2.93	131	5.74	160	4.96
Corpus uteri	0	0.00	0	0.00	0	0.00	7	0.53	16	0.78	23	0.72
Ovary	0	0.00	0	0.00	0	0.00	89	8.80	120	5.76	209	6.65
Other female genital	0	0.00	0	0.00	0	0.00	3	0.42	12	0.58	15	0.50
Prostate	213	19.62	261	18.26	474	18.73	0	0.00	0	0.00	0	0.00
Testis	3	0.47	8	0.35	11	0.35	0	0.00	0	0.00	0	0.00
Penis, other male organs	3	0.40	5	0.31	8	0.34	0	0.00	0	0.00	0	0.00
Bladder	49	4.67	43	2.94	92	3.67	18	1.39	14	0.69	32	0.93
Kidney, urinary	56	5.69	75	4.70	131	5.23	27	2.38	52	2.47	79	2.43
Brain and central nervous	38	4.89	68	3.74	106	4.00	38	4.08	35	1.56	73	2.31
Thyroid	2	0.22	5	0.33	7	0.29	0	0.00	14	0.68	14	0.44
Hodgkin's lymphoma	6	0.68	15	0.93	21	0.78	10	1.04	5	0.23	15	0.45
Non-Hodgkin's lymphoma	57	6.54	92	5.69	149	5.82	55	4.95	85	3.99	140	4.21
Multiple myeloma	28	2.68	56	3.66	84	3.31	28	2.20	44	2.16	72	2.23
Leukemia	84	9.20	106	5.51	190	6.97	61	6.23	101	4.43	162	5.04
TOTAL CANCERS[3]	1804	185.85	2330	151.43	4134	163.51	1468	134.72	2141	100.47	3609	111.35

[1]Total deaths reported for the period 1990-1993.
[2]Rates are per 100,000, standardized to the US 1970 population.
[3]Total includes other sites not listed in table.

APPENDIX I
Tables

Table 3. Comparison of Texas-Mexico border area incidence (1990-1992) and mortality (1990-1993) rates with California rates (1988-1992).

CANCER	INCIDENCE				MORTALITY			
	Males		Females		Males		Females	
	Anglo	Hispanic	Anglo	Hispanic	Anglo	Hispanic	Anglo	Hispanic
Buccal	1.05	1.12	0.99	1.15	1.00	1.49*	0.85	0.96
Esophageal	1.23	1.15	1.23	1.46	0.92	1.08	0.72	------
Stomach	0.87	0.91	0.91	0.93	0.65*	1.09	0.91	1.05
Colon	0.99	0.80*	1.00	0.79*	0.91	0.89	0.98	0.65*
Rectum	0.93	0.72*	0.74*	0.72*	0.57*	0.49*	0.43*	0.54*
Liver & intrahepatic	1.23	1.18	1.43	1.12	1.31	1.55*	1.67*	1.32*
Gallbladder	0.76	1.32	1.14	1.04	-----	1.34	0.84	1.09
Pancreas	0.92	0.93	0.69*	0.98	0.98	1.06	0.77*	1.05
Peritoneum	-----	1.88*	-----	-----	-----	-----	-----	-----
Nasal, sinus, ear	-----	-----	-----	1.75	-----	-----	-----	-----
Larynx	1.22	-----	0.83	1.09	1.18	0.99	-----	-----
Lung & bronchus	1.00	0.99	0.85*	0.85*	0.92	1.08	0.80*	0.77*
Bone	-----	1.56	-----	1.29	3.22*	1.08	-----	1.37
Soft tissue	0.98	1.11	1.42	1.31	-----	1.38	2.03*	1.17
Melanoma	0.87	0.65	0.73*	0.53*	0.76	0.80	0.77	0.93
Breast	1.92*	-----	0.96	0.94	-----	-----	0.91	0.97
Cervix	n/a	n/a	1.25	1.10	n/a	n/a	1.33	1.33*
Corpus uteri	n/a	n/a	0.76*	0.73*	n/a	n/a	-----	0.56*
Ovary	n/a	n/a	1.02	0.88	n/a	n/a	1.02	0.98

-----No comparison done due to instability of Texas border area rates (i.e., less than 10 cases/deaths reported).
*Statistically significant different from 1.00 at the p=0.05 level.

Table 3. Continued.

CANCER	INCIDENCE				MORTALITY			
	Males		Females		Males		Females	
	Anglo	Hispanic	Anglo	Hispanic	Anglo	Hispanic	Anglo	Hispanic
Other female genital	n/a	n/a	-----	0.66	n/a	n/a	-----	0.32*
Prostate	1.01	0.85*	n/a	n/a	0.81*	1.03	n/a	n/a
Testis	1.01	1.04	n/a	n/a	-----	-----	n/a	n/a
Penis	-----	1.18	n/a	n/a	-----	-----	n/a	n/a
Bladder	1.12	0.99	1.00	0.83	0.79	1.18	0.87	0.77
Kidney	0.92	1.08	0.75	1.23*	1.24	1.00	1.13	1.12
Brain	0.86	0.80	1.12	0.77	0.87	0.98	1.05	0.68*
Thyroid	1.04	0.90	1.29	1.04	-----	-----	-----	1.36
Hodgkin's lymphoma	0.86	1.28	0.85	1.21	-----	1.55	2.60*	-----
Non-Hodgkin's lymphoma	0.83	0.91	1.15	0.93	0.82	0.95	0.93	0.95
Multiple myeloma	0.82	1.04	1.04	0.86	0.81	1.18	1.05	0.94
Leukemia	1.04	1.01	1.02	1.08	1.07	0.92	1.33*	1.03
ALL SITES	0.98	0.93*	0.95*	0.94*	0.91*	1.08*	0.91*	0.95*

-----No comparison done due to instability of Texas border area rates (i.e., less than 10 cases/deaths reported).
*Statistically significant different from 1.00 at the p=0.05 level.

APPENDIX II

Percent of Cancer Cases Microscopically Confirmed and Percent of Death Certificate Only Cases by Primary Site, Texas-Mexico Border Area, 1990-1992

PRIMARY SITE	NUMBER OF CASES	PERCENT MICROSCOPICALLY CONFIRMED	PERCENT DEATH CERTIFICATE ONLY
Buccal cavity	332	95.2	3.9
Esophagus	139	93.5	4.3
Stomach	363	92.8	5.0
Colon	942	94.4	4.1
Rectum	366	95.9	2.5
Liver	195	68.2	21.0
Gallbladder	152	85.5	8.6
Pancreas	323	73.7	12.1
Peritoneum	29	93.1	6.9
Nasal, Sinus and Ear	29	89.7	6.9
Larynx	164	93.9	5.5
Lung, Bronchus	1707	84.7	8.9
Pleura	22	86.4	9.1
Bone	47	95.7	2.1
Soft Tissue	103	94.2	1.0
Melanoma of Skin	191	97.4	1.6
Breast	1869	96.7	2.0
Cervix Uteri	379	93.9	3.2
Corpus Uteri	283	99.6	0.4
Uterus, Nos	35	74.3	25.7
Ovary	285	90.9	4.2
Other Female Genitalia	10	90.0	10.0
Prostate	1881	95.8	2.2
Testis	90	96.7	0.0
Penis	20	100.0	0.0
Bladder	415	95.4	2.4
Kidney	391	89.0	3.8
Brain and Nervous System	194	84.5	5.2
Thyroid	202	97.5	1.0
Hodgkin's Disease (lymphoma)	93	96.8	2.2
Non-Hodgkin's Lymphoma	506	92.3	4.3
Multiple Myeloma	158	93.0	5.1
Leukemia	414	88.6	8.5
Total Cancers	13,068	91.4	4.8

APPENDIX III

International Classification of Diseases for Oncology (ICD-O) Categories Used to Classify Primary Site

PRIMARY SITE CATEGORY	ICD-O CODE
Buccal cavity	140.0 - 149.9
Esophagus	150.0 - 150.9
Stomach	151.0 - 151.9
Colon	153.0 - 153.9, 159.0
Rectum	154.0 - 154.8
Liver	155.0 - 155.1
Gallbladder	156.0 - 156.9
Pancreas	157.0 - 157.9
Peritoneum	158.0 - 158.9
Nasal, sinus and ear	160.0 - 160.9
Larynx	161.0 - 161.9
Lung & bronchus	162.2 - 162.9
Pleura	163.0 - 163.9
Bone	170.0 - 170.9
Soft tissue	171.0 - 171.9, 164.1
Melanoma	173.0 - 173.9 (M - 8721 - 8799)
Breast	174.0 - 174.9, 175.9
Cervix uteri	180.0 - 180.9
Corpus uteri	182.0 - 182.8
Uterus, NOS	179.9
Ovary	183.0

PRIMARY SITE CATEGORY	ICD-O CODE
Other female genital	183.2 - 183.9, 181.9, 184.0, 184.8 - 184.9
Prostate	185.9
Testis	186.0 - 186.9
Penis	187.1 - 187.4
Bladder	188.0 - 188.9
Kidney & urinary	189.0 - 189.9
Brain & nervous system	191.0 - 192.9
Thyroid	193.9
Hodgkin's Disease (lymphoma)	M - 965.0 - 966.9
Non-Hodgkin's lymphoma	M - 9590 - 964.2, 967.0 - 971.0, 975.0 - 975.9,
Multiple myeloma	M - 973.0 - 973.9
Leukemia	M - 980.0 - 994.9, 995.1

APPENDIX IV

Ninth Revision ICD Mortality Categories Used to Classify Primary Site

PRIMARY SITE CATEGORY	ICD-9 CODE
Buccal cavity	140.0 - 149.9
Esophagus	150.0 - 150.9
Stomach	151.0 - 151.9
Colon	153.0 - 153.9, 159.0
Rectum	154.0 - 154.1
Liver	155.0 - 155.2
Gallbladder	156.0 - 156.9
Pancreas	157.0 - 157.9
Peritoneum	158.0 - 158.9
Nasal, sinus and ear	160.0 - 160.9
Larynx	161.0 - 161.9
Lung & bronchus	162.2 - 162.9
Pleura	163.0 - 163.9
Bone	170.0 - 170.9
Soft tissue	171.0 - 171.9, 164.1
Melanoma	172.0 - 172.9
Breast	174.0 - 175.9
Cervix uteri	180.0 - 180.9
Corpus uteri	182.0 - 182.9
Ovary	183.0
Other female genital	183.2 - 184.9, 181.0

APPENDIX IV - continued

PRIMARY SITE CATEGORY	ICD-9 CODE
Prostate	185.0 - 185.9
Testis	186.0 - 186.9
Penis, other male organs	187.1 - 187.9
Bladder	188.0 - 188.9
Kidney & urinary	189.0 - 189.9
Brain & central nervous system	191.0 - 192.9
Thyroid	193.0 - 193.9
Hodgkin's Disease (lymphoma)	201.0 - 201.9
Non-Hodgkin's lymphoma	200.0 - 200.9, 202.0 - 202.2, 202.8 - 202.9
Multiple myeloma	203.0, 203.2 - 203.9
Leukemia	202.4, 203.1, 204.0 - 208.9,

APPENDIX V

Table 1. Population Estimates by Age, Race and Ethnicity Texas-Mexico Border Area, 1990-1992[1].

Males

AGE	ANGLO	HISPANIC	TOTAL
0 - 4	27394	207741	235135
5 - 9	28053	195176	223229
10 - 14	27221	207311	234532
15 - 19	27339	213703	241042
20 - 24	31858	163227	195085
25 - 29	32865	143690	176555
30 - 34	33899	137228	171127
35 - 39	33112	121566	154678
40 - 44	33550	104909	138459
45 - 49	26270	76147	102417
50 - 54	22627	60981	83608
55 - 59	22097	52299	74396
60 - 64	24733	49447	74180
65 - 69	26919	43933	70852
70 - 74	25391	27401	52792
75+	30978	38260	69238
TOTAL	454306	1843016	2297322

Females

AGE	ANGLO	HISPANIC	TOTAL
0 - 4	25733	200130	225863
5 - 9	25770	188348	214118
10 - 14	25638	202159	227797
15 - 19	24435	207718	232153
20 - 24	24699	172828	197527
25 - 29	30488	157415	187903
30 - 34	32929	157349	190278
35 - 39	33094	144449	177543
40 - 44	31430	124314	155744
45 - 49	25166	91109	116275
50 - 54	21899	76188	98087
55 - 59	22040	67955	89995
60 - 64	26927	65943	92870
65 - 69	30865	54141	85006
70 - 74	27731	35720	63451
75+	42923	58818	101741
TOTAL	451767	2004584	2456351

[1]Population estimates used in calculation of incidence rates.

APPENDIX V

Table 2. Population Estimates by Age, Race and Ethnicity Texas-Mexico Border Area, 1990-1993[1].

Males

AGE	ANGLO	HISPANIC	TOTAL
0 - 4	36145	287550	323695
5 - 9	36745	259773	296518
10 - 14	36093	279226	315319
15 - 19	36116	288262	324378
20 - 24	42412	227163	269575
25 - 29	42977	194232	237209
30 - 34	45127	185440	230567
35 - 39	44271	165642	209913
40 - 44	44688	143471	188159
45 - 49	35932	105938	141870
50 - 54	30393	82995	113388
55 - 59	29219	70819	100038
60 - 64	32509	65947	98456
65 - 69	35662	59206	94868
70 - 74	34353	38394	72747
75+	42087	51573	93660
TOTAL	604729	2505631	3110360

Females

AGE	ANGLO	HISPANIC	TOTAL
0 - 4	34027	277271	311298
5 - 9	33815	250439	284254
10 - 14	33897	272152	306049
15 - 19	32154	279708	311862
20 - 24	32927	238019	270946
25 - 29	39495	211719	251214
30 - 34	43871	211632	255503
35 - 39	44168	197045	241213
40 - 44	42141	170216	212357
45 - 49	34380	126521	160901
50 - 54	29526	103214	132740
55 - 59	28979	91916	120895
60 - 64	35212	88038	123250
65 - 69	40967	74113	115080
70 - 74	37765	49595	87360
75+	58143	79560	137703
TOTAL	601467	2721158	3322625

[1]Population estimates used in calculation of mortality rates.

Texas Cancer Registry

Texas Department of Health
1100 W. 49th Street
Austin, Texas 78756